

PRESSURIZED AIR DISTRIBUTION SYSTEM

RIGHTS OF THE GOVERNMENT

The invention described herein may be manufactured and used by or for the Government of the United States for all governmental purposes without the payment of any royalty.

BACKGROUND OF THE INVENTION

The present invention relates generally to personal cooling garments and associated cooling systems and methods for protection of personnel working in hot contaminated environments, and more particularly to a system for providing intermittent cooling to personnel wearing protective garments and working in a hot contaminated (chemical, biological, radioactive) environment.

Background information related to personal cooling systems and methods for personnel wearing protective garments and working in hot contaminated environments is presented in copending application Ser. No. 07/907,279 entitled "Open Loop Cooling Apparatus", the teachings of which are incorporated herein by reference.

Prior art cooling units generally suffer a disadvantage that a substantial weight represented by a portion of the cooling system (e.g., a backpack) may need to be carried by the personnel during the work, the units may need to be situated near the work area and the freedom of movement by the personnel during work may therefore be limited, and the cooling capacity may be limited.

The invention described herein solves or substantially reduces in critical importance problems with prior art systems as just suggested by providing an effective and inexpensive system for supplying intermittent clean cool and dry air at sufficient pressure and flow rate to provide relief from heat stress to subjects wearing protective garments and working in hot contaminated environments. The system may find use in chemical, nuclear or biological applications, nuclear power plants, chemical waste treatment and hazardous/toxic areas.

It is therefore a principal object of the invention to provide an effective and inexpensive system for supplying cool and dry air to personnel wearing protective garments while working in a hot contaminated environment.

It is a further object of the invention to provide a system for supplying intermittent clean cool and dry air to personnel working in a hot contaminated environment.

These and other objects of the invention will become apparent as a detailed description of representative embodiments proceeds.

SUMMARY OF THE INVENTION

In accordance with the foregoing principles and objects of the invention, a system for providing intermittent cooling for personnel wearing protective clothing and working in a hot contaminated environment is described which comprises a large flow capacity air control plenum operatively connected to an air conditioner of prescribed capacity and to suitable filters and blower for supplying about 20 cfm per person of air at a pressure of about 11 inches of water, wherein at least 80% of the system throughput is recirculated in providing the desired flow.

DESCRIPTION OF THE DRAWINGS

The invention will be more clearly understood from the following detailed description of representative embodiments thereof read in conjunction with the accompanying drawing which is a perspective drawing of a representative system of the invention.

DETAILED DESCRIPTION

Referring now to the drawing, shown therein is a schematic perspective view of a pressurized air distribution system 10 representative of the invention. Conventional air conditioning systems are configured generally to supply cool air at less than one-inch water resistance. Personal cooling systems required for protection of persons working in a contaminated environment may generally present resistance of 11 inches or more. A requirement for system 10 may then be to provide to 200 cubic feet per minute (cfm) (20 cfm per person) of air at a pressure above atmospheric of about 7 to 14 inches of water (preferably about 11 inches) to a plurality of protective suits 11 in order to cool up to ten subjects 12 working in a contaminated environment, and to provide sufficient cool conditioned air to cool suit(s) 11 at a desirable preselected temperature in the range of about 60° to 70° F. Then in accordance with a principal feature of the invention, system 10 is operatively connected to air conditioning unit 14 having a cooling capacity of at least 1.5 tons (18,000 BTUH) and 1,000 cfm (such as a model A/E 32C-39, American Air Filter Company, model MPC 25-1H, Heat Controller Inc., or model MD-1SSIV, Thermo King Corp) so that in the operation of system 10 in supplying 20 cfm to each subject, at least 80% of the flow is recirculated, that is, a maximum of 20% of the available flow is diverted to the outlets to provide the desired flow to each subject.

System 10 includes large flow capacity air control plenum 16 having a first inlet 17 operatively connected to outlet 18 of air conditioner 14 through duct 19 for receiving flow of conditioned air. First outlet 21 of plenum 16 is operatively connected to inlet 22 of air conditioner 14 through duct 23 for conducting unused conditioned air and ambient replacement air to air conditioner 14. Each duct 19, 23 may preferably comprise flexible ducts of nominal 6 to 12 inch diameter to provide desirably high throughput for system 10. In order to provide the desired airflow and cooling to each of ten protective suits 11, it is desirable to provide a throughput through plenum 16 sufficient so that no more than about 20% (preferably about 20 cfm) of throughput drawn off therefrom is sufficient to cool the ten suits. Utilizing a small percent of the available throughput has the unexpected result that for an air conditioner 14 of given size, maximum cooling and drying of air supplied obtains at minimum flow rate.

Ambient air inlet 25 to system 10 is connected to a two-stage centrifugal blower 27, preferably having high efficiency and high throughput, for supplying ambient air into air conditioner 14. Blower 27 is operatively connected to second inlet 28 of air control plenum 16. Sufficient flow of ambient air through inlet 25 and blower 27 is required only to replace that air bled off from air control plenum 16 for cooling suit(s) 11 in the operation of system 10 as more discussed fully below.

Conditioned air for cooling suits 11 is drawn from air control plenum 16 at second outlet 30 into junction box 31 and through filter 33 (or two or more filters 33 in parallel as suggested in the figure) and into manifold 35